Non invasive assessment of the inflammatory states using the TSI index

Jaume Millán[1] , Erik Weber Jensen[1], Montserrat Vallverdu[1], Gertrude Nieuwenhuijs-Moeke[2], Michel Struys[2]

1. Biomedical engineering, School of Industrial Engineering of Barcelona (ETSEIB) – Universitat Politècnica de Catalunya (UPC), Barcelona, Spain

2. Department of Anesthesiology, University Medical Center of Groningen, The Netherlands

INTRODUCTION:

Inflammation monitoring can support the early identification of systemic inflammatory response syndrome (SIRS) and sepsis [1,2]. As one of the main causes of death in intensive care units, sepsis demands prompt diagnosis and treatment. Many commonly used biomarkers are either invasive or unsuitable for continuous, real-time assessment [3]. Heart rate variability (HRV) provides insight into autonomic function and inflammatory status [4,5]. Anesthesia can affect HRV [6]. The TSI index compensates for the effects of anesthesia in HRV using the Brain Activity Index, which quantifies the level of consciousness. The non-invasive Trending of Sepsis and Inflammation (TSI) index combines HRV with EEG-based consciousness monitoring to evaluate inflammatory activity and estimate sepsis risk [7].

OBJECTIVE:

To validate the TSI index in abdominal surgery and HIPEC procedures.

METHODS:

A database was used for this post-hoc study. Approvals from the local ethics committees at Quirónsalud and UMCG were obtained for the original data. The study included cohorts of abdominal surgery patients at Quirónsalud Barcelona (n=41) and HIPEC patients at UMCG (n=62). The TSI was derived using RMSSD, heart rate, LF/HF ratio, and the EEG-based Brain Activity (BA) index, measured with the CoreSys One system (1 ECG and 2 EEG channels, sampled at 1024 Hz). Data recordings were segmented into phases: for Quirónsalud patients, basal and intraoperative phases; for UMCG patients, basal and HIPEC phases.

RESULTS:

TSI demonstrated significant differences (all $p<0.05$) across all pairwise comparisons between clinical states (surgical/HIPEC phases). Figure 1 showcases the distribution of the TSI across the different clinical states.

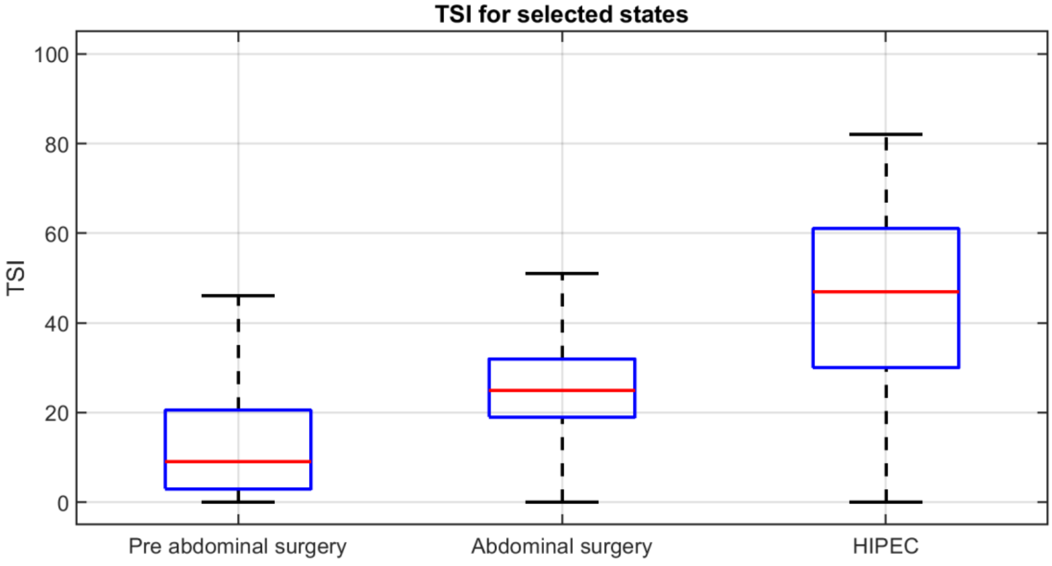

Figure 1 TSI values across clinical states. Surgical patients (Quirónsalud Barcelona, n=41) shown at pre-surgery and intraoperative (abdominal surgery) phases. HIPEC patients (UMCG Groningen, n=62) showcasing the HIPEC phase. TSI is derived from CoreSys One monitor (ECG and EEG).

CONCLUSIONS:

TSI reliably differentiates inflammatory states across various clinical settings and reflects severity levels, demonstrating its potential for non-invasive monitoring.

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